USER-FRIENDLY BRAHMI-DERIVED HINDI KEYBOARD

Background of the Invention

5   The Hindi script is a subset of the Devanagari script which in turn evolved from the ancient Brahmi script (FIG 7). Other Indian languages using the Devanagari script include Marathi and Sanskrit. Other scripts derived from Brahmi include: Gujarathi, Oriya, Punjabi (also called Gurmukhi); Bengali, Assamese, Telugu, Tamil, Kannada, Malayalam (India); Sinhala (Sri Lanka); Nepali (Nepal-derived from Devanagari);

10   Burmese (Myanmar - Burma); Tibetan (Tibet); Laotian (Laos); Thai (Thailand); Khmer (Cambodia); Java, Bali, Batak, Bugis/Buginese (Indonesia); and Tagalog (Philippines)

Hindi is the official language of India. Most Indian school children are required to study Hindi from an early age. In India there are approximately 200 million native Hindi speakers, while more than 300 million use it as their second language. There are

15   approximately 10 million Hindi speakers outside India, primarily in Nepal.

The Devanagari script includes many more characters than western scripts such as the Roman script for the English language. While Hindi has only 12 vowels and 33 consonants, a language written in Devanagari script, such as Hindi, may include in excess of 550 characters because various phonetic characters are combined into

20   conjunct characters. The large number of characters can make keyboard-entry of Devanagari script burdensome and complicated. Furthermore, this problem is exacerbated by the fact that many languages besides Hindi use the Devanagari script (e.g., Marathi and Sanskrit) and Devanagari-based keyboards may cater to all of them, thereby generating additional complexities.

25   Existing Hindi keyboard solutions typically focus on making available all or most of the 500+ characters of the Devanagari script. These comprehensive keyboards may involve complexities such as multiple virtual keyboards and multiple key-stroke characters. These complexities tend to make existing keyboard solutions difficult to learn and use. For these reasons, keyboards based, for example, on the Inscript layout

tend to be difficult to use. Additionally, none of the existing keyboards have the whole script, or even most of it, visible on the keyboard.

A variety of solutions have been proposed with regard to keyboards for use with other languages such as English, Korean, Chinese, and Japanese. For example, United States Patent No. 5,836,705 describes a keyboard arrangement to maximize typing speed and data entry and to ease transition from a QWERTY keyboard. This keyboard uses a layout wherein the home keys are assigned according to the frequency of use of the letters.

United States Patent No. 5,945,928 describes a keyboard for the Korean Language. Keys on a keyboard are assigned a plurality of jamos (characters). Additional word processor software analyzes key sequences to resolve ambiguities and determine which characters are intended.

United States Patent No. 5,999,950 describes an on-screen keyboard for the Japanese language. An array of Japanese based Kana characters are displayed. The first selection of a character key causes the display of the character in base kana form. The second consecutive selection of the same key causes the display of the character in a variant form. Subsequent consecutive selections cause the display of the character in further variant forms.

United States Patent No. 6,053,647 describes a "user-friendly and efficient keyboard" for the English language. The keyboard layout places punctuation marks in the center of the keyboard with letters arranged alphabetically on either side of the punctuation marks.

United States Patent No. 6,231,252 describes a downsized keyboard for use with the Japanese language. One vowel is assigned to each key of a first key group. Two consonants are assigned to each key in a second key group. An unvoiced consonant is input with a single key-pressing operation while a voiced consonant is input with a double key-pressing operation.

United States Patent No. 6,275,216 describes a keyboard for entering characters for the Japanese language. One embodiment of the keyboard executes inputting of a

character by zero, one, or a plurality of strokes of a code key and sequential stroke of a separator key for selecting a letter.

United States Patent No. 6,281,884 describes a user-definable keyboard apparatus for use with the Chinese language. A key may correspond to one or more
5   Chinese characters and a character may be assigned to one or more keys. The apparatus may automatically verify that a user-defined keyboard is rational by reference to a character sound grouping rules table.

Summary of the Invention

A user-friendly and efficient keyboard vector which allows a character input
10   system uses a real or virtual keyboard having a plurality of keys, at least some of which are assigned to at least one Brahmi-based script character, such as a Devanagari character, and at least one key being assigned a halant. For simplicity, aspects of the system are described with reference to the Hindi language. However, the keyboard system and method may also be adapted for use with other language scripts that are
15   derived from the Brahmi script.

The vowels of the Hindi script may be grouped together on the keyboard and may be assigned to keys that correspond to the number-row on a standard keyboard. The "vowel signs" or **Matras** may be accessed by pressing the assigned vowel key with a modifier key (e.g., SHIFT).

20   In Hindi, the consonants are divided into five Varg subsets and one Non-Varg group. The keyboard may map the five Varg consonant subsets that each contain the five phonetically-related consonants. The Varg consonants may be spatially grouped in sets of five in the way they are learned. Keys of each Varg set may be grouped on keys that are adjacent or diagonal to one another on the keyboard. The keys of each Varg
25   may be grouped in a single row on the keyboard. The final Non-Varg consonants may be mapped to keys that are grouped together on the keyboard. In one embodiment, eight non-varg consonants are mapped to a group of eight keys.

In another embodiment, vowel keys are mapped to the Hindi vowels, at least some of the vowel keys being arranged in a row. Initial consonants keys are arranged in

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a plurality of subsets that include keys that are mapped to a group of phonetically-related Varg consonants. At least some of each subset of initial consonant keys may be arranged on a single row, which may be configured horizontally or in another configuration. Final consonant keys (non-Varg) may also be mapped to Hindi final

5   consonants, and at least some of the final consonant keys may be arranged in a row.

A halant key may be assigned to the halant character to provide a simplified character set, thereby reducing the number of keys and, therefore, the learning curve for the keyboard user.

In another embodiment, a computer system for use with a language using Hindi

10 script includes a processor, a memory system, a graphical user interface, and a Hindi script keyboard. The keyboard may include a plurality of keys, at least some of which are assigned at least one Hindi script character, and at least one key being assigned a halant. The key assignments may be spatially grouped on the keyboard according to phonetic characteristics of the characters.

15 In another embodiment, a keyboard adapted for use with Hindi script language may include a group of vowel keys each being assigned a Hindi script vowel, the vowel keys comprising keys corresponding to the number-row on a standard keyboard. The Matras may be accessed by pressing the appropriate vowel key with a modifier key (e.g., SHIFT).

20 The keyboard may also include a first group of phonetically-related consonant keys comprising keys corresponding to Q-W-E-R-T on a standard keyboard. The keyboard may further include a second group of phonetically-related consonant keys comprising keys corresponding to A-S-D-F-G on a standard keyboard. The keyboard may further include a third group of phonetically- related consonant keys comprising

25 keys corresponding to Z-X-C-V-B on a standard keyboard. The keyboard may further include a fourth group of phonetically- related consonant keys comprising keys corresponding to Y-U-I-O-P on a standard keyboard. The keyboard may further include a fifth group of phonetically- related consonant keys comprising keys corresponding to H-J-K-L-; on a standard keyboard.

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Brief Description of the Drawings

FIG. 1 is a plan view of a keyboard showing Hindi characters mapped to one character set (G_1), i.e., upper ASCII set.

FIG. 2 is a plan view of a keyboard showing additional Hindi characters mapped to the G_1 character set which may be accessed using an additional key (e.g., the SHIFT key).

FIG. 3 is a plan view of keys including characters of the first Hindi Varg set.

FIG. 4 is a block diagram of a computer system for use with the keyboard.

FIG. 5 is a plan view of the preferred and alternate embodiments of the Hindi keyboard showing Hindi characters mapped to a first character set. The five Varg consonants subsets (V1 to V5) and the Non-Varg consonants (NV) are indicated.

FIG. 6 shows Hindi vowels and consonants.

FIG. 7 shows the various Indian language scripts derived from Brahmi.

Detailed Description of the Preferred Embodiment

As shown in FIGS. 1 and 2, the layout for a keyboard 20 includes a subset of characters from the Brahmi-based Devanagari script, specific to Hindi. For convenience, reference will be made to the Hindi script and alphabet, although the description and keyboard may also be applied to related Brahmi-derived scripts that have similar characteristics.

Other Brahmi-derived Indian scripts include the Northern scripts Marathi, Sanskrit, Gujarati, Punjabi, Assamese, Bengali, Oriya, Manipuri and Southern scripts Telugu, Tamil, Malayalam, and Kannada. Brahmi derived scripts used in languages outside India include Sinhala, Nepali, Burmese, Tibetan, Laotian, Thai, Khmer, Javanese, Bali, Batak, Bugis/Buginese and Tagalog.

As shown in FIG 1, a portion of the Hindi alphabet may be mapped to the upper ASCII (G_1) character set and the appropriate keyboard files modified, so that the Hindi script may be directly accessed from the keyboard. A key, which may be "sticky," may be used to access English. To simplify use of the keyboard, a "halant" may be used below leading consonants to type both consonants rather than create all the double

letters which exist. This use of a halant is an accepted way to write Hindi, and it immediately cuts the number of Hindi character key locations from in excess of 550 to less than 55. This order of magnitude reduction considerably shortens any learning curve.

5   An additional software program may be used to run through the inputted material and replace all the halant derived compound characters (e.g., consonantal conjuncts) with traditional conjuncts from a library. This may be used in real time or at the end of the input sequence.

A standard personal computer keyboard can typically have two sets of
10   characters (G_0 and G_1) which are accessible by using the SHIFT and/or the CAPS_LOCK keys. A keyboard configured for English does not require use of the second character set (extended ASSCII or the G_1 set) because the English alphabet (26 characters) fits on the first character set (the G_0 set). The G_1 set is, however, used by other languages. For example, French, German and the Scandinavian languages use the
15   G_1 set for their Umlauts, Diacritic signs, and accents. The G_1 set is also used with Russian for its Cyrillic alphabet.

The keyboard layout shown in FIGS. 1 and 2 includes the Hindi G_1 character set. FIG. 2 shows vowel signs (Matras) and additional commonly used conjuncts accessed by the SHIFT key. The standard QWERTY keyboard (i.e., the G_0 set) may be
20   accessed by another modifier key, e.g., the CAPS_LOCK key.

A. HINDI VOWELS

The keyboard may include keys mapped to Hindi vowels, as shown in Fig. 1 and 5. The various Brahmi-based Indian script languages generally use up to 18 vowels.
25   Hindi uses 13 vowels.

In FIG. 1, the 13 vowel characters of Hindi are provided on the top row of the standard keyboard layout (Row 1). On the standard keyboard, this row typically includes the numerals 1 to 9 and 0 as well as other symbols such as the hyphen (-) and equals (=). To simplify use of the keyboard, all the vowels are provided through the
30   keyboard as independent characters. Although the numerals may be displaced from the

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number row, the Hindi numerals may be made available on the number keypad, as shown in FIG. 1. However, in the majority of cases Roman numbers are used in Hindi (and other Indian languages). The Roman numbers can be accessed using the G_0 English script.

In addition to vowels, Hindi also includes "vowel signs." A vowel sign is typically represented using a diacritical mark, called a "Matra", which is written above, below, before, or after the consonant to which the vowel belongs. There are a variety of different Matra to signify various vowel sounds.

The combination of Hindi consonant characters with the various diacritical vowel markings results in a multiplicity of possible Hindi characters. Mapping the vowel signs to independent keys may drastically reduce the number of keys needed to generate these combinations. As shown in FIG. 2, the Matras (vowel signs) are provided in the first row of the keyboard layout in the G_1 character set and are accessed by the SHIFT key + Vowel key. In addition, combination characters may be provided in the G_1 character set.

It will be apparent to one skilled in the art that the vowels do not necessarily need to be placed on the number row. For example, in an alternative embodiment as shown in FIG. 5, all the vowels could be grouped to the left side of the keyboard and the Varg consonants grouped elsewhere on the keyboard.

B. HINDI CONSONANTS

In FIG. 1, Varg consonants in the G_1 character set are arranged in **rows Q-W-E-R-T, A-S-D-F-G, Z-X-C-V-B, Y-U-I-O-P, H-J-K-L-;** and **N-M-,-.-/**. These rows of 5 characters extend across the keyboard in a horizontal or left-right direction (i.e. on a standard keyboard) in FIG. 1. A row may also be defined in another direction (i.e. 4-R-F-V on a standard keyboard). Commonly used compound consonant characters are shown in the G_1 character set in FIG. 2 and may be accessed by pressing the SHIFT key. Other Brahmi derived scripts (e.g., Tamil and Thai) have additional sounds not derived from Brahmi and these may also be accessed using the Shift key.

Hindi consonants may be characterized as "Varg" and "Non-Varg". Varg consonants are arranged in groups of five consonants, as indicated in FIG. 6. The Hindi script includes five Vargs sets (V1, V2, V3, V4, and V5) and a few non-Varg (uncategorized, NV) consonants. The consonants belonging to the five Vargs occupy

5   most of rows R2, R3, and R4. The remaining Devanagari characters in rows R2, R3, and R4 are non-Varg consonants. Additional non-Varg consonants, and a few double characters are included in the G_1 character set accessed by the SHIFT key shown in FIG. 2.

Referring now to FIG. 3, a key layout I for Varg 1 is shown. The first two

10   consonants of each Varg constitute the Primary Pair (PP). The second two consonants of each Varg constitute the Secondary Pair (SP). The second consonant of each pair is the aspirated counterpart (has an additional "h" sound) of the first consonant in the pair. The last consonant of the five consonants in a Varg includes a nasal pronunciation.

As shown in FIG. 1 and FIG. 3, the Varg consonants are mapped onto the

15   keyboard layout in a sequential group including, from left to right, PP, SP and the fifth consonant. While in FIG. 1 the Vargs appear in horizontal rows, it will be apparent to one skilled in the art that the consonants of each Varg could be grouped in a different manner than shown in FIG. 1. For example, consonants in a Varg could be clustered on keys that are adjacent (e.g. F-G or G-T) or diagonal (e.g. F-V) from one another, or

20   grouped onto diagonal rows (e.g. corresponding to keys **4-R-F-V** on a standard keyboard.)

Other Details:

1. **The Halant.** A "Halant" character allows two or more consonants to be read as a

25   single character. Some portions of Indian society find this "informal" scribing technique to be unacceptable because the practice departs from official written Hindi. Nonetheless, the Hindi-reading community generally understands and comprehends the technique of using Halants to join Hindi characters.

2. **The Viram.** The Hindi full stop (period) may be accessed by SHIFT and /. (FIG.2).

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3. **The Anuswar.** The Anuswar, a nasal inflection, may be accessed by a Matra key (SHIFT and -) FIG. 2.

4. **The Chandrabindu.** Another nasal inflection may be accessed by a Matra key (SHIFT and ') FIG.2.

5. **The Nukta**. The Nukta is needed for writing some URDU and Punjabi sounds in Hindi (accessed by \ as shown in FIG.1).

6. **Compound characters** commonly used Hindi: FIG. 2
   - 'thr' (SHIFT and y)
   - 'gya' (SHIFT and d)
   - 'shr' (SHIFT and m)
   - 'ksh' (SHIFT and ')
   - 'om' (SHIFT and a)
   - 'lla' -pronounced hard (SHIFT and ,)

7. The **half (r) sign** is a commonly used one and is mapped to SHIFT and \.

An additional software program may be used to run through the inputted material and replace all the halant derived compound characters (e.g., consonantal conjuncts) with traditional conjuncts from a library. This may be used in real time or at the end of the input sequence.

While the keyboard layout of FIGS. 1 and 2 generally avoids the overuse of compound characters (e.g., consonantal conjuncts) to limit the number of characters on the keyboard and thereby promote rapid learning and ease of use, commonly used conjuncts may nonetheless be accessed using the SHIFT key (FIG. 2). Additional space exists on the G_1 character set using the SHIFT key to either add more compound characters if needed or additional characters (e.g., for Tamil and Thai).

The keyboard may also provide for access to characters in the English alphabet using the G_0 lower ASCII set. For example, the G_0 lower ASCII set may be accessed with the CAPS_LOCK key. The SHIFT key + the CAPS_LOCK key may access uppercase Roman alphabet. This feature may be important to users because many Hindi speakers prefer to write in a combination of Hindi and English. In addition, email and many web sites may only be accessed through English-alphabet addresses.

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In one embodiment, pressing a particular key makes the English lower case (G_0) set available. Pressing another key, which may be a "sticky" key or the SHIFT key, makes English capitals accessible. In one particular embodiment, pressing the Caps Lock key makes the English lower case set available and pressing the remapped

5   LEFT_CONTROL key (or any other unused key) makes the English upper case set available. In another particular embodiment, pressing an applet on the desktop makes the English lower case set available and pressing the CAPS_LOCK makes the English upper case set available.

       In another embodiment, the key assignments may be spatially grouped on the

10   keyboard according to phonetic characteristics of the characters and the way they are learned. In this embodiment, all the vowels and consonants of the Hindi script may be presented on a single keyboard. A halant (half-letter) symbol may also be presented. The vowels may be grouped together, and the vowel signs (Matras) may be evoked by SHIFT + Vowel key. The Varg consonants may be grouped in sets of 5, and Vowel

15   diacritic signs (Matras), additional characters and commonly used compound characters (e.g., consonantal conjuncts) may be evoked by the Shift key.

       The keyboard may be used with a personal computer such as an IBM®, Compaq®, Dell®, or Apple® Macintosh® personal computer. A personal computer typically includes an operating system such as Windows 95®, Windows 98®, Windows

20   ME®, Windows NT®, Windows 2000®, Windows XP®, Mac OS 7®, Max OS 8®, Mac OS 9®, Mac OS X® or Linux® software. The keyboard may also be used with other types of computer systems.

       An example of a computer system 30 is shown in Fig. 4. The preferred hardware configuration may include a central processing unit 40, such as a

25   microprocessor, and a number of other units that may be interconnected by a system bus 50. The computer system 30 may also be spread out over one or more interconnected computers or computer systems.

       The system may also include a Random Access Memory (RAM) 70, Read Only Memory (ROM) 80, and an I/O adapter 90 for connecting peripheral devices such as

30   disk storage units 100 to the bus 50. A user interface adapter 110 for connecting several

input devices may also be included. Examples of possible input devices electronically coupled to the user interface adapter 120 include a keyboard 20, a mouse 130, a speaker 140, a microphone 150, and/or other user interface devices such as a touch screen. A communication adapter 160 may be included for connecting the system to a

5   communication network link 170. A graphical user interface 180 may also be coupled to the system bus 50 and provides the connection to a display device 190. It will be apparent to those skilled in the art that the mouse 130 may be a typical mouse as known in the industry, or alternatively a similar device such as a trackball, light pen, or the like. The system may be configured to use a real keyboard or a virtual keyboard, such as an

10   on-screen keyboard.

The keyboard system and method may be used with most popular existing operating systems. A small program may be distributed either by floppy, CDROM or downloadable from the web to provide the functionality and instructions for mapping and using Hindi characters on a standard keyboard.

15   To implement the keyboard system and method with the XWINDOW desktop system (e.g., Unix®, Linux®, Solaris® etc.), two XMM files (one for English and one for Hindi) may be invoked by two desktop applets. An editor (e.g., gedit) may be accessed to type documents. Other application software may also be accessed — for example Netscape® in Hindi which provides a web browser, an email client and allows the

20   composition of simple HTML web pages.

An additional software program may be used to run through the inputted material and replace all the halant derived compound characters (e.g., consonantal conjuncts) with traditional conjuncts from a library. This may be used in real time or at the end of the input sequence.

25   To implement the keyboard system and method with Microsoft Windows operating system, a separate TrueType font (TTF) file of Hindi character set may be invoked because Microsoft Windows, by design, does not generally allow low-level access to the keyboard. The Microsoft Windows driver may be a stand alone program running on the Microsoft Windows platform which includes fonts, a .DLL file, an

30   executable, a splash screen etc. When activated and the Hindi font is chosen, the driver

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may provide both Hindi and English functionality on a standard keyboard. Any key that is not assigned a Hindi character may be used to switch between Hindi and English.

An additional software program, specific to Microsoft Windows, may be used to run through the inputted material and replace all the halant derived compound

5   characters (e.g., consonantal conjuncts) with traditional conjuncts from a library. This may be used in real time or at the end of the input sequence.

The keyboard method and system may employ Unicode or the ISCII standard to uniquely code the script characters. Unicode allows all the combinations in all Indian languages to have a unique hex code. These hex codes may be generated by a keyboard

10   BIOS. Externally, the keyboard may have the same encoding vector.

While the embodiment shown in FIGS. 1 to 4 is configured for Hindi, the keyboard system and method can be easily adapted for related languages that use the Devanagari script or are derived from the Brahmi script of ancient India. For example, Devanagari script is also used to write Sanskrit, Nepali, Konkani, and Marathi. In

15   addition, most of the other officially recognized Indian languages (Bengali, Telegu, Marathi, Tamil, Gujarati, Kannada, Malayalam, Oriya, Punjabi, Assamese, Manipuri) derive their scripts from the Brahmi script. This general approach may also be used for non-Indian languages using Brahmi derived scripts (Sinhala, Nepali, Burmese, Tibetan, Laotian, Thai, Khmer, Javanese, Bali, Batak, Bugis/Buginese and Tagalog).

20   While these languages differ significantly from Hindi in syntax and grammar and the scripts may differ significantly in shape and combinations, the number of vowels and consonants are in the same ball-park range as Hindi. As a result, the keyboard embodiment shown may be adapted for use with all these languages. The keyboard method and system may have similar encoding vectors for vowels and

25   consonants for all the official Indian languages. Because each these languages may be assigned a unique Unicode hex code, it is also straightforward to make Unicode keyboards for these other languages.

As shown by FIGS 1, 2 and 5, the key concepts are not the assignment of particular characters to particular keys, but rather the majority of the alphabets of a

30   particular language displayed and grouped according to vowels, related consonants and

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the manner in which the characters are learned. Because the keyboard is based on assigning characters to keys of a standard keyboard, it is not necessary to build a specialized keyboard for use with the Hindi script and for other language scripts derived from Brahmi.

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<u>Glossary of Terminology:</u>

Anuswar: A dot above the character '□ ' representing a nasal sound.

Brahmi script: This elegant script appeared in India most certainly by the 5th century BC, but just like the Greek alphabet, it has many local variants, which suggests that its

10   origin lies further back in time. It is in this script that the ancient Indian king Asoka inscribed his laws onto monumental columns. The Brahmi script was the ancestor of all Indian writing systems, including the Devanagari. In addition, many Asian scripts, such as Burmese, Thai, Tibetan and even Japanese to a very small extent (vowel order), were also derived from Indian script. Thus the Brahmi script was the Indian equivalent of the

15   Greek script from which many different scripts originated.

The Brahmi script

a	a	i	r	u	ū
e		ai	o	–ṃ	
ka	kha	ga	gha		
ća	ćha	ja	jha	ña	
ṭa	ṭha	ḍa	ḍha	ṇa	
ta	tha	da	dha	na	
pa	pha	ba	bha	ma	
ya	ra	la	ḷa	va	
śa, ṣa	sa	ṣa	sa	ha	

Chandrabindu: Is a crescent and a dot above the character representing a nasal sound.

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Devanagari script: A highly cursive descendent of the Brahmi script. Many languages, such as Hindi, Sanskrit, Marathi and Nepali use the Devanagari script or a subset of it.

The Devanagari script

अ	आ	इ	ई	उ	ऊ
a	ā	i	ī	u	ū
ऋ	ॠ	ऌ	ॡ		
r	ŗ	l	ļ		
ए	ऐ	ओ	औ	अं	अः
e	ai	o	au	aṃ	aḥ
क	ख	ग	घ	ङ	
ka	kha	ga	gha	ńa	
च	छ	ज	झ	ञ	
ca	cha	ja	jha	ña	

ट	ठ	ड	ढ	ण	
ța	țha	ḍa	ḍha	ṇa	
त	थ	द	ध	न	
ta	tha	da	dha	na	
प	फ	ब	भ	म	
pa	pha	ba	bha	ma	
य	र	ल	व		
ya	ra	la	va		
श	ष	स	ह		
śa	ṣa	sa	ha		

5   **G₀ and G₁ character sets:** The first 128 characters in the ASCII 8-bit encoding scheme are referred to as the lower (G_0) character set. These typically code the lower and upper case Roman English alphabet. The remaining character set space (upper character set, extended ASCII character set or G_1 set) are not used in English but are used to code special additional characters e.g., umlauts in German, accented French characters or the
10   Cyrillic alphabet of the Russian language.

Halant: This is a sign (an oblique dash) below the leading character of a pair (usually consonants) which signifies a conjunct of the two characters. This is an accepted way of joining 2 consonants instead of using an additional unique character. This cuts down the number of keys by an order of magnitude.

Inscript keyboard layout: The official Indian language keyboard encoding vector which encodes the whole Devanagari script. This includes Hindi, Marathi and Sanskrit languages.

ISCII (INDIAN SCRIPT CODE FOR INFORMATION EXCHANGE) is an encoding method which allows unique codes for all Indian script characters. It is essentially a subset of the Unicode standard.

Keyboard Encoding Vector: The <u>order</u> in which the letters of a script are arranged on the keyboard

Matra: This is a vowel diacritic sign.

Nukta: This is the dot below, i.e., "**.**" – it is used for deriving other characters in Devanagari, Punjabi and when Urdu is written using Devanagari.

Om: A commonly used Hindu religious symbol.

Script: A complete set of characters used for the written form of one or more languages, e.g., the Roman script for the English Language, i.e., a, b, c….x,y,z.

Vargs: These are the initial <u>consonants</u> phonetically grouped in 5's. There are 5 such Varg groups of consonants. Additional, final consonants are the Non-Varg consonants (8 in Hindi).

Viram: This is a full stop sign in Hindi (|). Verse endings in Sanskrit use a double Viram (| |).

Visarg: Comes after a vowel and represents the 'h' sound. In Tamil this represents the Aytham ' .ˑ. ' sound.

The above specification, examples and data provide a complete description of the manufacture and use of the composition of the invention. Since many embodiments of the invention can be made without departing from the spirit and scope of the invention, the invention resides in the claims hereinafter appended.